

Machines Example Graph and Table  
NCSO 2020

**Disclaimer:**

The purpose of this document is to help students prepare their charts for the NCSO regional and state tournaments. It is **NOT** an extension of the rules and does not supercede the rules, however the event supervisors of some NC regional tournaments, the NC State Tournament, and the 2020 National Tournament (Division C only) will use the interpretation of the rules explained in this document, unless otherwise noted.

On the following page is a table and a graph that would receive full points for categories 5.e.i-iii (spanning mass range, 10 data points, proper labeling). This is one acceptable chart, but there are other possible ways to receive full credit, which are described below. The graph and table were produced from the same dataset.

To receive full credit for the chart score, students must abide by rules 5.e.i-v, detailed below:

**5.e.i. Data Spans Mass Range:** One way to receive points for this is to have data spanning the *mass ratio* range detailed in rule 2.e., (from 1:1 to 1:5.5 for Division B States, which is what this document uses). Alternatively, the data can instead span the *mass* range of 20 to 800 g, also detailed in rule 2.e., but **ONLY** if the independent variable on the chart is mass. That isn't what this chart uses, but it is still acceptable.

**5.e.ii. 10 Data Points:** Each graph/table must include at least 10 distinct data points, with each data point representing a distinct trial. A trial might include placing two weights on the device and measuring the distances between the weight and the fulcrum for each weight, at equilibrium, which is what this document used.

**5.e.iii. Proper Labeling:** In the case of a graph, students must properly label both axes and give the graph a title. For a table, each data category (column) must be labeled. Units must be included when applicable.

**5.e.iv. Four Graphs:** Even though both a table and a graph are presented, students only need to include one or the other *for any given dataset* to receive full credit. However, students must have either a table or a graph, or both, from **four distinct datasets** to receive full credit for having 4 charts.

**5.e.v. Device Diagram:** Teams will need to include a labeled device diagram, not pictured here.

**Sample Middle School (Varsity) - Table 1**

H = distance (from the fulcrum) of the heavier weight, at equilibrium

L = distance (from the fulcrum) of the lighter weight, at equilibrium

H (cm)	L (cm)	L/H	Actual Mass Ratio
36	35	0.972	1
25	35	1.400	1.5
19	35	1.84	2
15	35	2.33	2.5
12	35	2.91	3
11	35	3.18	3.5
9	35	3.89	4
9	35	3.89	4.5
8	35	4.385	5
7	35	5.00	5.5

Sample Middle School (Varsity) - Measured Distance Ratio vs. Actual Mass Ratio (Graph 1)

